

NOTES ON PUERTO RICAN BITING MIDGES OR CULICOIDES (DIPTERA: CERATOPOGONIDAE)

By IRVING FOX, School of Tropical Medicine,
San Juan, Puerto Rico.

Progress in the taxonomy of the Neotropical species of *Culicoides* is greatly handicapped because they are known, for the most part, from females only. Of the sixty odd species reported from this region, the males of more than two-thirds are unknown, an unfortunate situation because that sex in its hypopygium nearly always exhibits much better characters for separation of species than does the female. In this paper the male hypopygia of five Puerto Rican species are described and illustrated, and also important characters of the females not brought out in the original descriptions are emphasized; four of these species are new records for Puerto Rico.

The material which provided the basis for this work is in the entomological collection of the Department of Medical Zoology, School of Tropical Medicine, San Juan, Puerto Rico, where it accumulated through the efforts of several collectors. Particular thanks are due in this connection to Capt. Charles E. Kohler, U. S. Public Health Service, John W. H. Rehn, Columbia University and Capt. George D. Penick, M. C., Army of the U. S. for their courtesy in permitting examination of their light trap collections.

Culicoides hoffmani Fox

Culicoides hoffmani Fox, Ent. Soc. Amer. Ann. 39: 251, Figs. 6 and 9, 1946.

Male hypopygium.—Ninth tergite with broad triangular apico-lateral processes. Aedoeagus distally divided into three processes (Fig. 1, a); harpes and processes of the sidepiece as shown in Fig. 1, c. Ninth sternite broadly notched.

Female.—Antenna with the segments in a series continuously increasing in length without an abrupt change between segments 10 and 11. Palpus (Fig. 1, d) with the second segment considerably shorter than the third, the pit of the latter circular and prominent. Spermathecae (Fig. 1, b) with the base of the ducts broad and sclerotized for a more than usual distance.

Material.—The comments and illustrations concerning this species are made from a male and a female specimen, selected from a small series, reared out of tree-hole débris collected at Mameyes, Puerto Rico on November 5, 1948. The male is designated the

allotype. Several males and females reared out of tree-hole débris collected at Luquillo, Puerto Rico, May 12, 1932 are also in the collection.

Remarks.—This species, originally described from Trinidad, is very similar to the Brazilian *C. debilipalpis* Lutz in the structure of the female palpus and in the arrangement of the light and dark spots of the wing. It differs however in the palpus which in *debilipalpis* has the second segment as long as the third. The male of *debilipalpis* has not been described.

Culicoides borinqueni Fox and Hoffman

Culicoides borinqueni Fox and Hoffman, Puerto Rico Jour. Pub. Health and Trop. Med. 20: 110, Fig. 4, 1944.

Male hypopygium.—Ninth tergite with the anterior border notched, the apico-lateral processes long. Aedoeagus and harpes as shown in Figs. 2, a and d. Inner process of the sidepiece slender and acuminate. Ninth sternite broadly excavated.

Female.—Antenna with the last five segments markedly differing in length and shape from the others, the change between segments 10 and 11 being abrupt. Palpus (Fig. 2, e) with the second segment shorter than the third, the latter massive with a large, distinct pit. The wing, illustrated more accurately than in the original description, is shown in Fig. 2, b. Spermathecae (Fig. 2, c) with the base of the ducts sclerotized for a short distance.

Material.—Re-described and illustrated from the female holotype (Fig. 2, e), a female paratype (Figs. 2, b and c) and the male allotype. The species has not been collected again since it was first discovered at Palmas Abajo, Puerto Rico in 1931. The published record from Luquillo, P. R. (Fox, 1946, p. 252) was an error of determination, *C. hoffmani* being involved.

Remarks.—While very similar to *debilipalpis* in the female wing as has been pointed out by Dr. Macfie (1948, pp. 73 and 87), this species is immediately distinguished from it by the antenna and the palpus which are very different from those of the Brazilian form.

Culicoides trilineatus Fox

Culicoides trilineatus Fox, Ent. Soc. Amer. Ann. 39: 250, Figs. 5 and 11, 1946.

Male hypopygium.—Ninth tergite notched, the apico-lateral processes broad and triangular. Aedoeagus and harpes as shown in Figs. 3, and c. Ninth sternite broadly excavated.

Female.—Antenna with the segments continuously increasing in length without an abrupt change in shape between segments 10 and 11. Palpus (Fig. 3 d) with the second segment almost as long as the third. Cell M_1 of the wing with two light spots but the proximal one smaller and less distinct than the distal. Spermathecae (Fig. 3, b) with the base of the ducts narrow and sclerotized for a long distance.

Material.—The male is described from a specimen, designated the allotype, which was reared out of tree-hole débris collected November 5, 1948 at Luquillo, Puerto Rico. The comments and illustrations concerning the female were made from two specimens which emerged from the same material.

Remarks.—This species, which was originally described from St. Thomas, is also similar in certain respects to *debilipalpis* as has been mentioned by Dr. Macfie (1948, p. 72). The female differs however in the peculiar pattern of the mesonotum and in the wing which is provided with many macrotrichia in the anal cell, characters which were illustrated in the original description. The fact is that all three of the above species show strong resemblances in the pattern of light and dark spots of the female wing to *debilipalpis*. One may possibly be the same as the Brazilian species known from the female only (although the writer does not think so) but all three cannot be because the hypopygia of the males are markedly different from each other, not even suggesting any relationship.

Culicoides guttatus (Coquillett)

Ceratopogon guttatus Coquillett, N. Y. Ent. Soc. Jour. 12: 35, 1904.

Male hypopygium.—Aedoeagus (Fig. 4, a) differing from the other members of the subgenus (*Hoffmania* Fox, 1948) in that the tip is button-like rather than ball-like. The harpes (Fig. 4, d) are similar to those of *C. diabolicus* Hoffman, but united for a greater portion basally than in that species.

Female.—Antenna with the segments in a series continuously increasing in length without an abrupt change between segments 10 and 11. Wing (Fig. 4, b) characterized particularly by the presence of a small isolated dark spot near the tip of vein R_{4+5} and by the dark cross-vein. Spermathecae (Fig. 4, c) with the base of the ducts sclerotized for a very short distance.

Material.—The male was described and illustrated from a specimen taken in a light trap at Camp Tortugero, Puerto Rico, August 6, 1948, which is designated the allotype. The illustrations of the

female were made from a specimen in the same lot (Fig. 4, b) and from another (Fig. 4, c) taken in a light trap at Camp O'Reilly, Puerto Rico, Aug 30, 1948.

Remarks.—The species believed to be *guttatus* is widely distributed in the Neotropical Region, for in addition to these from Puerto Rico, specimens have been studied from Brazil, Venezuela and Mexico. Dr. Macfie (1948, p. 70) indicates six possible synonyms—*diabolicus* Hoffman, *flariferus* Hoffman, *bimaculatus* Floch and Abonnenc, *paintereri* Fox, *pseudodiabolicus* Fox and *trinidadensis* Hoffman. From the zoological point of view there is little doubt that this species differs from the one known as *diabolicus* because the hypopygia are different. If Dr. Macfie is right in his principal point, a nomenclatorial one, that *diabolicus* Hoffman is the same insect which Coquillett described as *guttatus* then the species under consideration would appear to require a new name since *bimaculatus* (known only from the female) is said to lack the dark cross-vein, and the other names have already been disposed of (Fox, 1948). The late Dr. W. A. Hoffman believed the species here re-described, of which he had female specimens from Brazil, to be *guttatus* and the writer concurs in this opinion.

Culicoides loughnani jamaicensis Edwards

Culicoides loughnani var. *jamaicensis* Edwards, Bul. Ent. Res. 13: 165, Pl. III, fig. 10, 1922.

Male hypopygium.—Ninth tergite straight without a distinct notch, the apico-lateral processes large. Aedoeagus and harpes as shown in Figs. 5, a and c. Inner process of the sidepiece very

EXPLANATION OF PLATE I

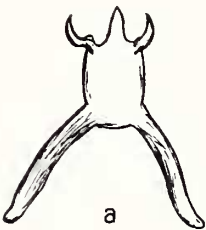
FIG. 1. *Culicoides hoffmani* Fox. a, aedoeagus; b, spermathecae; c, harpes; d, female palpus.

FIG. 2. *C. borinqueni* Fox and Hoffman. a, aedoeagus; b, female wing; c, spermathecae; d, harpes; e, female palpus.

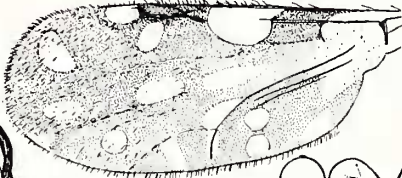
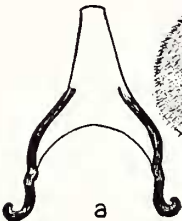
FIG. 3. *C. trilineatus* Fox. a, aedoeagus; b, spermathecae; c, harpes; d, female palpus.

FIG. 4. *C. guttatus* (Coq.) a, aedoeagus; b, female wing; c, spermathecae; d, harpes.

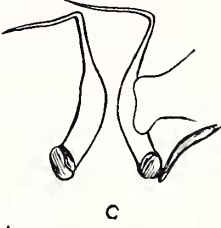
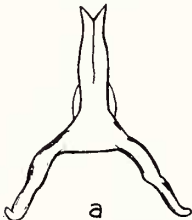
FIG. 5. *C. loughnani jamaicensis* Edwards. a, aedoeagus; b, spermathecae; c, harpes; d, female mesonotal pattern; e, female palpus.



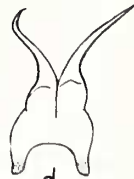
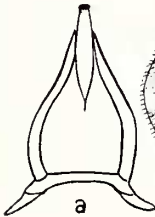
1. *hoffmani*



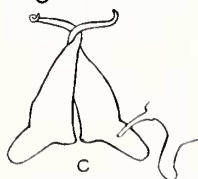
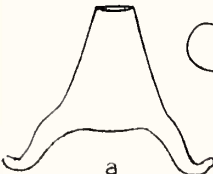
2. *borinqueni*



3. *trilineatus*



4. *guttatus*



5. *jamaicensis*

narrow. Membrane between the aedoeagus and the ninth sternite not spiculate.

Female.—Eyes very close together, contiguous at least partly. Antenna with the last five segments markedly different in length and shape from segments 4–10 which are subequal; the change between segments 10 and 11 abrupt. Palpus (Fig. 5, e) with the third segment much larger than the second and bearing a circular pit on a prominent tubercle. Mesonotum with a distinct pattern as shown in Fig. 5, d. Wing with the light and dark spots arranged exactly as shown in the photograph illustrating the original description. Spermathecae (Fig. 5, b) with the base of the ducts not sclerotized.

Material.—The comments and illustrations concerning this species are based on a male and a female specimen from Sabana Seca, Puerto Rico collected by means of a light-trap August 22, 1948. The male is designated the allotype.

Remarks.—This insect was originally described from Jamaica and has been reported from the Canal Zone (Hoffman 1925, p. 283) and Mexico (Macfie 1948, p. 80). It is similar to *copiosus* Root and Hoffman but differs in several important features. The hypopygium is different in that the ninth tergite is straight and there is no spiculate membrane between the aedoeagus and the ninth sternite. The female wing differs in that the distal light spot in cell R_5 reaches the anterior border while in *copiosus* it does not do so. The spermathecae of *jamaicensis* differ from those of *copiosus* in that no part of the base of the ducts is sclerotized.

LITERATURE CITED

- Fox, I. 1946. A review of the species of biting midges or *Culicoides* from the Caribbean Region. Ent. Soc. Amer. Ann. 39: 248–258, Figs. 1–11.
- , 1948. *Hoffmania*, a new subgenus in *Culicoides* (Diptera: Ceratopogonidae). Biol. Soc. Wash. Proc. 61: 21–28, Figs. 1–8.
- Hoffman, W. A. 1925. A review of the species of *Culicoides* of North and Central America and the West Indies. Amer. Jour. Hyg. 5: 274–301, Pl. I, Figs. 1–12; Pl. II, Figs. 1–17.
- Macfie, J. W. S. 1948. Some species of *Culicoides* (Diptera: Ceratopogonidae) from the State of Chiapas, Mexico. Ann. Trop. Med. and Parasitol. 42: 67–87, Figs. 1–10.